Wilderness and its role in the preservation of biodiversity: the need for a shift in emphasis

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INTRODUCTION

The conservation of Australia's remaining wilderness areas is now regarded as a matter of some importance. Since the latter part of 1987, New South Wales, South Australia and Victoria have passed specific acts which either provide administrative frameworks for the identification of wilderness, or which establish a system of wilderness parks and wilderness zones. This paper reviews the role of these legislative instruments in the protection of native plant and animal communities, and argues that there is a need for a shift in emphasis in legislative approaches to the conservation of Australia's wilderness if wilderness areas are to play a more meaningful role in the effective preservation of biodiversity. In particular, it is argued that a basic conflict exists between the role played by wilderness in the preservation of biodiversity, and the continuing emphasis placed on wilderness as a recreational resource.

In arguing for a shift in emphasis away from considerations of the human use of wilderness to an emphasis on its role in the preservation of existing ecological communities and processes, this paper begins by reviewing some of the more recent Australian definitions of wilderness. The basic concerns of the preservation of biological diversity are discussed, and the linkages between the preservation of biodiversity and the conservation of wilderness identified. Reference is made to the American approach to wilderness conservation. Under this approach there has been a growing recognition of the linkages between wilderness conservation and the preservation of biodiversity, but as noted, this recognition has yet to result in enhanced protection of either native flora or fauna. Reference is then made to recent Australian legislative approaches to the conservation of wilderness, and the way in which these approaches have largely failed to adequately deal with the inherent conflict between the human use of wilderness, and the role of wilderness in the preservation of native plant and animal communities. Finally, suggestions are made as to how efforts to conserve Australian wilderness might ultimately contribute to more effective preservation of biodiversity.

Definition of Wilderness in the Australian context

An American authority on the conservation of wilderness once stated that there cannot be one universally acceptable definition of wilderness because of the many and changing attributes of wild country (Nash 1982). It is therefore not surprising that a significant number of definitions of wilderness can be found in the recent Australian literature on wilderness conservation.

Among those cited by the Report of the Wilderness Working Group (1986) was the definition developed by the Australian Conservation Foundation. This defined wilderness as "a large tract of primitive country with its land and waters and its native plant and animal communities substantially unmodified by humans and their works" (Wilderness Working Group 1986:6). Another cited in the Group's report was that of Helman, who defined wilderness as "a large area of land perceived to be natural, where genetic diversity and natural cycles remain essentially unaltered" (Wilderness Working Group 1986:7).

Other current definitions include that developed by the Land Conservation Council of Victoria. In a recent report, Wilderness: *Special Investigation: Final Recommendations*, wilderness was defined as:

> "A large area with landforms and native plant and animal communities relatively unaltered or unaffected by the influence of the European settlement of Australia, and of sufficient size and shape and location with respect to adjacent land uses to make practicable the long-term protection of its natural systems and primitive condition; which is managed to maintain and enhance wilderness quality values" (Land Conservation Council 1991:29).

The views presented in this discussion paper are those of the author, and do not represent a change in official policy by either the NSW National Parks and Wildlife Service or the New South Wales State Government.

Also of recent vintage is the definition of wilderness provided in a recent report to the Minister for the Arts, Sport, the Environment and Territories. According to the authors of this report:

"A wilderness area is an area that is, or can be restored to be:

- of sufficient size to enable the long-term protection of its natural systems and biological diversity;
- substantially undisturbed by colonial and modern technological society; and
- remote at its core from points of mechanized access and other evidence of colonial and modern technological society" (Robertson, Vang and Brown 1992:26).

Wilderness has also been legally defined in Australia with the establishment of criteria for wilderness identification within several legislative instruments. Principal among these is the Wilderness Act 1987 (NSW), which stipulates that an area of land shall not be identified as wilderness unless:

(a) the area is, together with its plant and animal communities, in a state that has not been substantially modified by humans and their works or is capable of being restored to such a state;

(b) the area is of sufficient size to make its maintenance in such a state feasible; and

(c) the area is capable of providing opportunities for solitude and appropriate self-reliant recreation (The Wilderness Act 1987 s.6(1)).

Somewhat in contrast to this, the Wilderness Protection Act 1992 (SA) stipulates that in order for land to be regarded as wilderness:

(a) the land and its ecosystems must not have been affected, or must have been affected only to a minor extent, by modern technology;

(b) the land and its ecosystems must not have been seriously affected by exotic animals or plants or other exotic organisms (Wilderness Protection Act 1992 s.3(2)).

Several common elements within the various Australian definitions of wilderness are readily apparent. There is a general recognition that wilderness areas must be large, or at least of sufficient size to make their maintenance in a wilderness state feasible. Wilderness areas must of necessity feature essentially intact or unmodified landforms and native plant and animal communities. There is growing recognition that, by definition, wilderness areas must provide for the long-term protection of natural systems and genetic and biological diversity. The need to rehabilitate areas of disturbance is also recognized. Finally, there is growing and explicit recognition of the greater detrimental impacts of the application of colonial and modern technology over that applied by Aboriginal land managers prior to European settlement. In the recognition of the need to protect natural systems and processes, and of the impacts of post-settlement technology, is found two of the major linkages between wilderness conservation and the preservation of biodiversity.

The Concept of Biodiversity and its Links to Wilderness Conservation

In order to understand the linkages between the preservation of biodiversity and the conservation of wilderness, one must first come to an understanding of what biodiversity is, and why it is important.

As with wilderness, there is no one best definition of biodiversity available. As Noss (1990a:356) has noted:

"A definition of biodiversity that is altogether simple, comprehensive, and fully operational (i.e., responsive to real-life management and regulatory questions) is unlikely to be found".

While many people still equate biodiversity with the number of species within a particular area (Noss 1990b), the topic of biodiversity ranges from the conservation of species and ecosystems to the right of nations to exploit naturally occurring genetic material (Bradsen 1992). As such, "it involves complex moral, philosophical, spiritual, environmental, scientific, political, legal, and economic issues" (Bradsen 1992:175). The failure to define biodiversity has at times threatened to divert attention from what is in fact "a serious and difficult problem that deserves long-term scientific consideration" (Walker 1992:19).

At its most basic level, biological diversity refers to the variety and variability among living organisms and the ecological processes within which they occur (Cordell and Reed 1990). Diversity is described as existing at three fundamental levels: ecosystem diversity, species diversity, and genetic diversity (Noss 1990a). Associated ecological processes include such things as interspecific interactions, natural disturbances, and nutrient cycles (Noss 1990a).

This basic definition of biodiversity requires considerable amplification. Building on the three fundamental levels identified in the previous level, at the macro level ecosystem diversity refers to the number and distribution of different kinds of ecological communities within any given geographic area (Wolke 1991). At the intermediate level, species diversity refers to both the absolute number of species and the evenness of their relative abundances (Wolke 1991). This definition can be further amplified through reference to the three principal types of species diversity recognized. *Alpha diversity* refers to the diversity of species within a relatively homogeneous community type; *beta diversity*, the degree of change of species composition along an environmental gradient, as one moves from one community type to another; and *gamma diversity*, which is the diversity of species in a landscape or larger geographic region (Wolke 1991). Finally, at the micro level, genetic diversity includes within and between-deme components (Noss 1990b).

These are not the only elements of ecological complexity which comprise the full range of biological diversity (Walker 1992). Other phenomena to be considered include phenotypic plasticity; genetic variability within a population; ecotypic variation; functional diversity; community diversity; and landscape diversity (Walker 1992). Declines in biodiversity can and do occur at all fundamental levels, and within all elements of biological heterogeneity (Walker 1992).

Heightened awareness of, and concern for biodiversity issues stems from a growing awareness that the biological diversity of the planet has begun to decline at near-unprecedented rates. While it is not possible to provide precise estimates of the number of species currently being extinguished because of uncertainty over the number of species originally present, the rate of species extinction is now proceeding at a rate much faster than that prior to 1800 (Wilson 1988).

In terms of tropical rainforest habitats alone, an estimated minimum of 50 000 invertebrate species per year are doomed to extinction because of habitat destruction (Ryan 1992). It is likely that ecosystems with more limited numbers of species than rainforests are losing even greater proportions of their life forms. Also likely is the disappearance of genetic variation within species and entire natural communities at rates greater than those for the extinction of species themselves (Ryan 1992).

The rate at which diversity is now being reduced "seems destined to approach that of the great natural catastrophes at the end of the Paleozoic and Mesozoic eras — in other words, the most extreme in the past 65 million years" (Wilson 1988:11–12). However, unlike previous mass extinctions, which severely reduced the number of animal species without equivalent reductions in the number of plant species, the mass extinction now underway is also resulting in sharp declines in the number of extant plant species (Wilson 1988).

Australia has not been spared significant reductions in biodiversity. Since 1788, some 120 plant and animal species are known to have become extinct. This includes 7% of Australia's known mammal species, giving Australia the worst mammal extinction rate of all of the continents. Some 500 additional species of mammals, birds, fish and other Australian vertebrates are now threatened with extinction (Robertson, Vang and Brown 1992). This is of particular significance, as many Australian species are not found elsewhere in the world. At the species level 90% of Australia's mammals, 70% of Australia's birds, 85% of Australia's flowering plants, 88% of Australia's reptiles and 92% of Australia's frogs occur only in Australia (BDAC 1992).

The principal cause of the accelerating loss of biodiversity is readily apparent. As Ehrlich (1988:21) noted, "[T]he primary cause of the decay of organic diversity is not direct human exploitation or malevolence, but the habitat destruction that inevitably results from the expansion of human populations and human activities." Many thousands of plant and animal species are now at risk of extinction, not because they are being directly utilized to satisfy human wants and needs, but "because humanity is destroying habitats; paving them over, logging, overgrazing, flooding, draining, or transporting exotic organisms into them while subjecting them to an assault by a great variety of toxins and changing their climate" (Ehrlich 1988:22).

The full extent of habitat destruction is not known with any degree of complete accuracy. Some examples of known habitat destruction are, however:

- reduction of the world's tropical forests by nearly half their original area;
- logging or clearing of 56% of the 31 million hectares of temperate rainforest originally in existence, with less than 10% of old-growth rainforest in the contiguous United States still surviving; and
- loss of more than 90% of wetlands in Australia, New Zealand and California (Ryan 1992).

In addition, the fragmentation of habitat has led to heightened extinction risk for a broad range of fauna species. The net result of both habitat destruction and habitat fragmentation for such species has included:

- a recent world-wide decline in amphibian species;
- declines in populations or the threat of extinction for three-fourths of the world's bird species;
- the loss to deforestation of in the order of 100 invertebrate species per day;
- the threat of extinction for almost half of Australia's surviving mammal species;
- serious declines in number for virtually all species of wild cats and most bears;
- the threat of extinction for more than two-thirds of the world's 150 primate species; and
- 42% of the world's 270 turtle species being either rare or threatened with extinction (Ryan 1992).

The realization that the preservation of wilderness can contribute to the preservation of biological diversity is not a recent phenomena. More than 140 years ago, Henry David Thoreau wrote of the value of wilderness, and of the need to preserve the natural environment (Thoreau in Nash 1990). In the 1940s, Aldo Leopold (1987) would write of the role of wilderness as a norm for the way in which healthy land maintains itself, and as a laboratory for the study of land-health. More recently still, Hendee and Stankey (1973) described how a biocentric approach to wilderness management sought to maintain the natural processes of environmental change. Since then, the links between wilderness and biodiversity have been expressed in more explicit terms, and the need to preserve wilderness held to be of global importance. The maintenance of wilderness, it is stated, "benefits all mankind through maintenance of essential biophysical processes and protection of genetic diversity" (Dearden 1989:214–15).

In more specific terms, wilderness is now believed to have the capacity to represent more levels of biological organization in better health than can smaller and more heavily modified areas (Noss 1990b). Wilderness areas provide habitat for species which do not get along well with humans. The success of wilderness in performing this role is demonstrated by the fact that the only places in the world which still retain healthy populations of all native carnivores are large wilderness areas (Noss 1991). Wilderness areas provide space for threatened and endangered species to survive. In the United States, "[M]ore than one-half of current wilderness areas protect one or more federal or state listed species that are classified as threatened and/or endangered" (Cordell and Reed 1990:32). Large wilderness areas, in particular, represent "the only opportunity to maintain the ecological gradients and mosaics that constitute native biodiversity at the landscape level" (Noss 1990b:52). As the next part of this paper demonstrates, however, the preservation of wilderness areas has not always resulted in the effective preservation of biodiversity.

Wilderness and Biodiversity in the United States

When the United States Wilderness Act was passed in 1964, its purpose was "to establish a National Wilderness Preservation System for the permanent good of the whole people." The intention was to ensure "that an increasing population . . . does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition." Lands within the system were to be administered "for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness . . " (Wilderness Act 1964).

In the nearly 30 years since the system was established, its size has increased more than ten-fold, expanding from the original 9.1 million acres (3.7 million hectares) to some 91 million acres (37.3 million hectares). During that time, the scope of the system's role, and the debate over that role, has expanded as well.

One of the first papers to identify a potential link between the National Wilderness Preservation System and the preservation of biodiversity was published in 1980. In this paper, the author posed the rhetorical question, ". . . if we view wilderness as a legacy that will enable future generations to better understand their heritage, aren't they entitled to a legacy truly representative of the diverse landscapes and ecosystems we share with our fellow creatures?" (Davis 1980:27). He further noted that of the 241 distinct ecosystems in the United States and Puerto Rico identified using a merged version of Bailey's "ecoregion" concept, and Kuchler's "potential natural vegetation mapping", only 112 were represented in the National Wilderness Preservation System (Davis 1980). Of these, only 50 ecosystem types were adequately represented. Another 51 ecosystem types were not even potential candidates for addition to the system (Davis 1980).

Some 10 years later, Cole (1990) was able to report that 157 of these basic ecosystem types were to be found in currently designated wilderness areas, and that there were predictions that representation would increase to some 200 ecosystem types by the year 2000. While the instant wilderness system created by passage of the Wilderness Act in 1964 was primarily mountainous Forest Service land in the West, in 1990 the system included a wide variety of ecosystem types, from alpine tundra to shortgrass prairie, swamp and ocean strand (Cole 1990).

This expansion of the system, and the greater variety of ecosystem types represented, would seem to indicate that the National Wilderness Preservation System is now playing a more significant and effective role in the preservation of biodiversity. However, as has been noted by Noss (1990b), as of 1988, 104 (40%) of the major terrestrial ecosystems identified still were not protected or represented within the system. If the criterion of 1 million hectares as the size above which protected areas are relatively self-sustaining is applied, then only five ecosystem types are adequately represented in designated wilderness, and all of these are in Alaska (Noss 1990b). Only one in five designated wilderness areas in the United States exceeds 100 000 acres (40 485 hectares) in size, with one in six being less than 5 000 acres (2 024 hectares) (Cole 1990). Thus, the majority of designated wilderness areas in the United States are not comprised of self-sustaining ecosystems.

Protected areas in the United States, in general, tend to be small and inadequate representations of the ecosystems they sample (Noss 1990b). Even national parks are dominated by small units (Noss 1990b). These small parcels of habitat require more active and costly management in order to ensure that wildlife populations are able to maintain their full complement of genes, species and functions (Ryan 1992). Such active management may not be enough, however, to ensure that reductions in biodiversity do not occur. Even Yellowstone National Park, the largest such park in the contiguous United States, is proving to be too small to maintain all of its indigenous species, having already lost one large mammal species (Wolke 1991). As a further example of the effects of reserve size, while Washington's comparatively small Mt Rainier National Park has lost seven species of mammals since its inception, Canada's much larger Kootenay-Banff-Jasper-Yoho complex retains all of its known indigenous mammal species (Wolke 1991).

As to the reasons why creation of the National Wilderness Preservation System has not resulted in the effective preservation of biodiversity and particularly of the top carnivores and large mammal species, as Sessions (1992) has recently noted, the Wilderness Act 1964 is essentially a pre-ecological document. During the late 1950s and early 1960s, when this measure was being debated, ecological knowledge was much more limited than at the present time. As a result, the provisions and stated purposes of the Wilderness Act 1964 "do not reflect the huge tracts of wilderness (protection zones) required for species and ecosystem protection, large mammal speciation, and planetary health" (Sessions 1992:119).

Another significant reason why the National Wilderness Preservation System has continued to play a less than effective role in the preservation of biodiversity is because wilderness designation and management issues continue to be debated largely around questions regarding the human use of wilderness. The demand for solitude and self-reliant recreation has provided powerful arguments for the establishment of wilderness systems in North America and elsewhere (Dearden 1989). In the United States, as a result, virtually all designated wilderness areas are open for recreational use, save for a few areas administered by the Fish and Wildlife Service, where recreation is not permitted because it would threaten the ecological and scientific values which these areas were originally established to protect (Cole 1990). The result of recreational use in some wilderness areas, according to a recent study by the General Accounting Office of the United States government, is extensive damage to trails and camping areas. With baseline and monitoring data on recreational use and resource conditions lacking, the study found that it was impossible to determine the full extent of deterioration, or to determine the trend in conditions (Cole 1990). In short, in many areas it was simply not possible to determine the degree to which the recreational use of wilderness was resulting in negative impacts to native plant and animal communities, and to a general decline in biological diversity.

There is significant scope for improvement. While the present situation is one in which "currently designated wilderness falls far short of representing the major ecosystems of the United States even as samples, much less as self-sustaining landscape mosaics with viable populations of large predators and their prey" (Noss 1990b:54), the National Wilderness Preservation System quite clearly has the potential to play a much more effective role in the preservation of biodiversity. What is needed above all else is the explicit recognition of biodiversity preservation and ecosystem representation as goals of the system (Cordell and Read 1990). From that recognition can come the expansion, restructuring and responsive management of the National Wilderness Preservation System necessary to ensure that it provides an effective means for the preservation of remaining intact native plant and animal communities and ecosystem types.

Biodiversity and Australian Wilderness

Australia's experience with legally designated wilderness areas is of a significantly more recent vintage than that of the United States. It is therefore difficult to state with any degree of certainty the extent to which these areas have contributed to the preservation of biodiversity in the past, or the potential they have to do so in the future. With two of the three wilderness measures referred to in the introduction to this paper having only been passed within the last eight months, there would seem to be little purpose in attempting to pass judgment on their role as measures for the protection of natural communities. All that can reasonably be done is to make some comments on the potential that these measures have for the preservation of biological diversity in the future.

Of the two most recent wilderness measures, South Australia's Wilderness Protection Act 1992 appears to be the most problematic. While the Act is intended "to provide for the protection of wilderness and the restoration of land to its condition before European colonization", this measure also provides for the creation of wilderness protection zones in which mineral exploration, mining developments and vehicle use will be permitted. The Wilderness Code of Management which is to be developed under the authority of the Act will provide some mechanisms for the protection of native plant and animal species and the preservation of wildlife and ecosystems. The Code is also intended to provide for the destruction of dangerous weeds and the eradication or control of noxious weeds and exotic plants; the control of vermin and exotic animals and other exotic organisms; and the control and eradication of disease of animals and vegetation. The extent to which the meeting of these objectives will contribute to the preservation of biodiversity remains to be seen.

Victoria's National Parks (Wilderness) Act 1992 appears to have greater potential as a means of preserving both wilderness and biodiversity. With this Act, Victoria is said to be the first state in Australia "to have addressed in a systematic manner the pressing issue of wilderness protection, and to have established a comprehensive, statewide system of wilderness parks and wilderness zones" (Harrowfield 1992:45). The Act, as passed, created 20 new wilderness zones within the national park system. The purpose of these zones is largely that of adding to the diversity of recreation settings in the parks, and to ensure that present and future generations will be able to undertake wilderness-style recreation in wilderness settings (Harrowfield 1992). The zones, with an average size of some 32 700 hectares, are likely therefore to be managed principally as recreational areas, rather than for protection of their native plant and animal communities. In addition to these zones, the Act also legally designated 20 remote and natural areas, averaging 13 445 hectares in extent, in which recreational activities such as four-wheel-drive vehicle touring and horse riding will continue to take place (Harrowfield 1992). As the emphasis under this legislation seems to be the provision of recreational opportunities, it might be appropriate to suggest that the wilderness and remote and natural area system that is being established in Victoria will not make a significant contribution to the preservation of biodiversity.

The first legal designations of wilderness in New South Wales took place in 1982. Between 1982 and 1985, 12 areas totalling some 346 800 hectares in extent were declared as wilderness areas under the provisions of Section 59 of the National Parks and Wildlife Act 1974. Ranging in size from 2 400 hectares to 92 400 hectares, these wilderness areas preserved essentially unmodified native plant and animal communities in only five of the state's national parks.

Passage of the New South Wales Wilderness Act in December of 1987 nominally at least provided for a more explicit link between the preservation of wilderness and the preservation of biodiversity, with the Act having as its principal object the permanent protection of wilderness areas. The wilderness management principles set down in the Act, however, reinforce the existing conflict between preservation of wilderness areas for biocentric reasons, and preservation for anthropocentric purposes.

According to Section 9 of the Wilderness Act 1987, a wilderness area shall be managed so as:

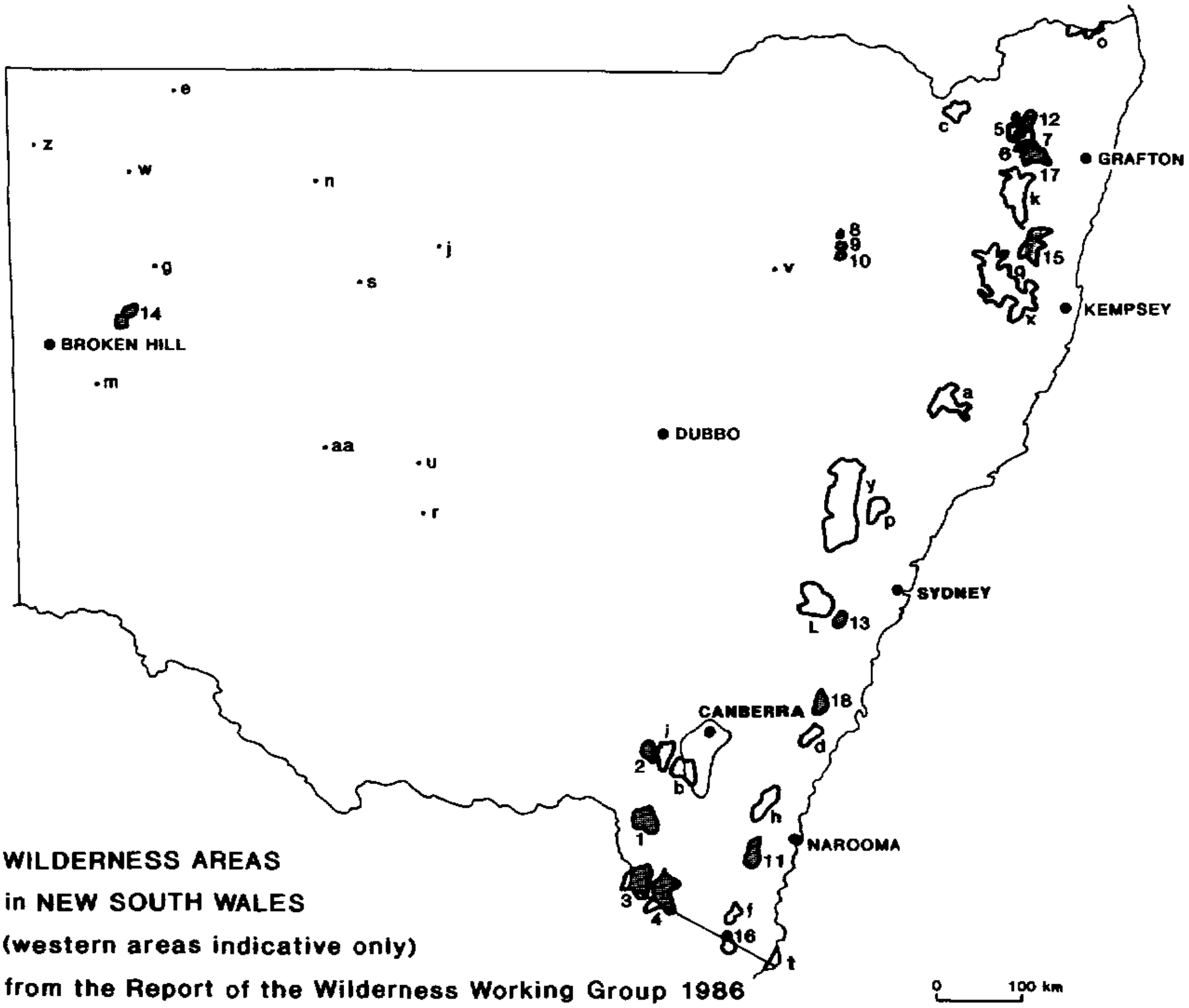
(a) to restore (if applicable) and to protect the unmodified state of the area and its plant and animal communities;

(b) reserve the capacity of the area to evolve in the absence of significant human interference; and

(c) to permit opportunities for solitude and appropriate self-reliant recreation.

Clearly, compliance with the first two parts of this section of the Act would contribute to the preservation of biodiversity at the species and community levels and to the continuance of associated ecological processes. Compliance with the third part of this section, however, carries with it the inherent risk that the provision of opportunities for the carrying out of recreational activities will result in future reductions in biological diversity.

The rate at which remaining wilderness areas in New South Wales are being provided with protection under the Wilderness Act 1987 is also a matter of some concern. While an additional six areas totalling some 190 522 hectares have been granted legal recognition under the Act within the last year, only 0.67% of the state (13.6% of reserved national parks and nature reserves) has now been afforded legal designation and management as wilderness. This is well short of the 4.4% of the state estimated to be of wilderness quality by the Wilderness Working Group in 1986. As in the United States, the debate over proposals to expand the amount of wilderness that has been granted legal recognition is largely couched "in terms of anthropocentric special interest compromise politics: of wilderness recreation versus motorized recreation and commercial interests" (Sessions 1992:119). Ecological concerns, although not completely overlooked, do not feature as prominently as they should in the current debate over conservation of New South Wales' remaining wilderness areas.



WILDERNESS AREAS
in NEW SOUTH WALES
(western areas indicative only)
from the Report of the Wilderness Working Group 1986

In summary then, it must be concluded that while some progress has been made toward achieving the goal of preserving remaining wilderness in South Australia, Victoria and New South Wales, all too often the measures enacted to achieve this goal have had as their foundation the premise that the greatest importance of wilderness is as a location for particular types of recreational activities. As a result, the contribution that legally designated wilderness areas potentially can make to the preservation of biological diversity has all too often been overlooked.

CONCLUSIONS

In a recent paper discussing the links between wilderness preservation and other conservation efforts, Dearden (1989) predicted that in order for wilderness to survive in future, arguments for its preservation would need to rest on biophysical rather than

Table 1. List of New South Wales wilderness areas indicated on the adjoining map.

PART A of this table indicates those areas of wilderness in New South Wales that have been given legal recognition through declaration as wilderness areas under the provisions of Section 59 of the National Parks and Wildlife Act 1974 and/or Section 8(1A) of the Wilderness Act 1987. These declared wilderness areas are entirely within lands reserved as national parks under the National Parks and Wildlife Act 1974. Their locations are designated numerically on the adjoining map.

PART B of this table indicates those areas of wilderness in New South Wales that have not been given legal recognition. These areas were principally identified by the Helman (H) Report 1976, and the Report of the Wilderness Working Group (WWG) 1986. The exceptions are Kinchega, identified in a 1972 Plan of Management for Kinchega National Park developed by the NSW National Parks and Wildlife Service (NPWS); and Lost World, proposed for wilderness identification and declaration under the provisions of Section 7(1) of the Wilderness Act 1987 by the Colong Foundation for Wilderness (CFW). In many instances, the formal identification of these and the legally declared wilderness areas follows upon informal identification dating back to the 1930s (i.e., declared wilderness areas in Kosciusko National Park). While the majority of the wilderness areas listed in Part B of this table include a significant proportion of land reserved as national park or nature reserve (*), they may also include lands reserved as State Forest, Vacant Crown Land, Crown leasehold land and freehold land. The locations of these wilderness areas are designated on the adjoining map alphabetically.

PART A: New South Wales wilderness areas legally recognized under the National Parks and Wildlife Act 1974 and/or the Wilderness Act 1987

Wilderness area	*Approximate size* (ha)
In Kosciusko National Park	
1. Jagungal	66 300
2. Bogong Peaks	25 600
3. Pilot	92 400
4. Byadbo	69 700
In Gibraltar Range National Park	
5. Haystack	2 900
6. Cooraldooral	4 000
7. Dandahra	2 400
In Mount Kaputar National Park	
8. Grattai	4 000
9. Nandewar	13 000
10. Rusden	8 000
In Wadbilliga National Park	
11. Brogo (part)	34 000
In Washpool National Park	
12. Washpool (part)	24 500
In Nattai National Park	
13. Nattai	29 824
In Mootwingee National Park	
14. Mootwingee	47 600
In New England National Park	
15. New England (part)	28 000
In Nungatta National Park	
16. Genoa (part)	6 100
In Nymboida National Park	
17. Mann (part)	18 998
In Morton National Park	
18. Ettrema	60 000

PART B: Other identified wilderness areas

(a)	Barrington * (H, WWG)	57 000
(b)	Bimberi * (H, WWG)	50 000
(c)	Binghi (H, WWG)	33 675
(d)	Budawang * (H, WWG)	70 600
(e)	Bulloo (WWG)	Not known
(f)	Coolangubra * (WWG)	24 400
(g)	Cooturaundee * (WWG) (1)	6 688
(h)	Deua * (H, WWG)	83 900
(i)	Goobarragandra * (H, WWG)	33 000
(j)	Gunderbooka (WWG)	Not known
(k)	Guy Fawkes * (H, WWG)	133 964
(l)	Kanangra-Boyd * (H, WWG)	125 000
(m)	Kinchega * (NPWS)	24 000
(n)	Kulkyne (WWG)	Not known
(o)	Lost World * (CFW)	6 000
(p)	Macdonald * (H, WWG)	89 600
(q)	Macleay Gorges * (H, WWG)	166 866
(r)	Matakana (WWG)	Not known
(s)	Mt Glass (WWG)	Not known
(t)	Nadgee * (H, WWG)	19 900 (NSW)
(u)	Nombinnie * (WWG)	Not known
(v)	Pilliga * (WWG)	Not known
(w)	Salt Lake (WWG)	Not known
(x)	Werrikimbe * (WWG)	30 700
(y)	Wollemi (Colo) * (H, WWG)	376 100
(z)	Yandaminta (WWG)	Not known
(aa)	Yathong (WWG)	Not known

*Includes a significant proportion of land reserved as national park or nature reserve.

[1] Not proposed for wilderness declaration.

Areas marked "Not known" have yet to be assessed in detail.

psychological arguments. There would need to be an explicit recognition of the role that wilderness areas "play in regulating essential life-processes, wildlife pools, genetic reservoirs, scientific inquiry and education" (Dearden 1989:209).

While that explicit recognition is now beginning to take place, generally the arguments which support the legal designation and resulting management of wilderness have been derived from concerns regarding diminishing recreational opportunities. While such arguments have led to the creation of wilderness protection systems in the United States, and more recently in several of the Australian states, all too often the individual wilderness areas designated have either been largely devoid of biological diversity (so-called "wilderness on the rocks" areas), or have been too small to be able to support self-sustaining ecosystems.

If designated wilderness areas are ultimately to play a more meaningful role in the preservation of biological diversity, then it must be recognized that wilderness is more than just a location that offers opportunities for solitude and recreational activities such as bushwalking and camping. There must be a recognition that wilderness areas, and most particularly large wilderness areas, provide an appropriate means of preserving biological diversity at the species and community levels. In the United States, this recognition is now beginning to play a role in the continuing debate over the ultimate size and essential function of the National Wilderness Preservation System. In those Australian states that have made specific legislative provisions for the preservation of remaining wilderness, frequently the debate over proposed wilderness declarations has centred on conflicting views over the recreational use of public lands. The role of wilderness in the preservation of biological diversity in Australia is all too often either downplayed or totally ignored.

In the final analysis, the designation and effective management of Australia's remaining wilderness areas has the potential to contribute to the maintenance of biological diversity in its broadest sense. This potential will only be realized, however, if all remaining wilderness areas are preserved, if areas which can be returned to a wilderness state are appropriately rehabilitated, and if recreation is no longer promoted as the best and most significant use of remaining wilderness areas.

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